NATURE AND COMPUTATION OF LABOR TURNOVER

The question of labor turnover is of comparatively recent origin. One of the first references to it was made only a few years ago by Professor John R. Commons, in an article on the "Wage Earners of Pittsburgh,"[1] wherein he tells of an establishment (a machine works) which "in a single year of continued prosperity, 1906 . . . . hired 21,000 men and women to keep up a force of 10,000." In the same article Commons quotes a Pittsburgh employer to the effect that "2,000 hirings in a year for 1,000 permanent positions was not an exaggerated index of labor's mobility in the Pittsburgh district."

Labor turnover represents a definite economic loss to employer, employee, and society at large. The employer's loss is due to (1) the clerical cost incidental to discharge and replacement; (2) the cost of training newly hired employees; (3) the wastage, breakage, etc., attributable directly to the inexperience of new employees; (4) the maintenance of idle machinery and equipment while separations are being replaced; and (5) the decrease in general efficiency of the organization due to the presence of large proportions of green hands.[2] Furthermore a large turnover involving, as it must, the presence in the organization of considerable numbers of inexperienced hands has a definite tendency to increase the frequency and severity of industrial accidents.[3] A considerable extent of the unemployment, even in normal times, may be said to be due to the constant shifting of workers from position to position. Such shifting necessitates, of course, temporary periods of idleness frequently injurious to the interests of the worker. The fact that society at large cannot possibly be the gainer from a

[1] *Charities and the Commons*, XXI (March 6, 1909), 1054.

[2] For estimates of the cost of labor turnover see (*a*) Magnus W. Alexander, "Hiring and Firing, Its Economic Waste and How to Avoid It," *American Industries* (August, 1915), p. 18; and (*b*) W. A. Grieves, "The Handling of Men," a paper published by the Executives' Club, Detroit Chamber of Commerce.

[3] Chaney and Hanna, "The Safety Movement in the Iron and Steel Industry," *Bulletin 234*, U.S. Bureau of Labor Statistics, p. 131.

constant shifting of labor needs no demonstration. There is no doubt that the general efficiency of our national industrial organization is diminished appreciably by large volumes of labor turnover.

Our entrance into the war, necessitating, as it did, the fullest possible development and most efficient application of our industrial powers, brought the labor-turnover question to the fore. To increase productivity it became necessary to reduce the turnover of labor. With this came the imperative necessity of defining the nature of labor turnover and of devising correct methods of measuring its extent.

Labor turnover is caused by separations which necessitate the employment of more than one person per position per year. By position in this connection is meant an extent of working time equivalent to the hours worked by one steadily employed person per year. The excess of the number of persons employed over the number of available positions represents a correct measurement of the extent of labor turnover. Table I, taken from a recent study of the author and presented herewith, shows the actual application of this method of measuring labor turnover. The number of available positions is shown in the table in column 4, entitled "Equivalent Number of Full-Time Workers." The figures of this column were arrived at by dividing the total annual labor hours of each occupation by a number (of hours) equivalent to the full annual working time of one permanently employed person. The footnote to column 4 indicates in detail the method followed in arriving at the total annual working hours of one permanently employed person. The figures in column 5 were arrived at as a result of an occupational census which covered the year in question.

A somewhat less satisfactory method of measuring labor turnover is found in comparing the number of available full-time positions, frequently referred to as the standard number of jobs, with the total of separations. This method was used in Table II, presented herewith. The number of full-time positions, or the standard number of jobs, shown in column 2 of Table II was arrived at in a manner similar to the one used in the study of labor turnover in the Cleveland cloak, suit, and skirt industry, as shown in Table I. The annual number of hours of labor

of one full-time worker (the labor hour equivalent of one full-time position) was also computed in the manner shown in Table I. The difference between the method used in Table I and the method applied in Table II lies in the determination of the number of persons employed during the year to fill the available

TABLE I[1]

LABOR TURNOVER IN THE CLEVELAND CLOAK, SUIT, AND SKIRT INDUSTRY FOR THE YEAR ENDING APRIL 1, 1918

Occupation and Sex	Number of Firms	Total Hours Actually Worked	Equivalent Number of Full-Time Workers*	Number of Workers Actually Employed	Percentage of Excess of Workers Actually Employed over Number of Full-Time Workers
Operators, male	4	398,673	181	235	29.8
Operators, female	4	815,724	371	701	88.9
Pressers, male	5	246,717	112	197	75.9
Pattern graders, male	4	22,421	10	9	.....
Cutters, male	8	239,997	109	198	81.7
Cutters, lining, etc., male	7	45,772	21	49	133.3
Sample-makers, male	6	43,033	20	22	10.0
Finishers, skilled, male	4	38,440	17	22	29.4
Finishers, skilled, female	4	631,928	287	531	85.0
Finishers, unskilled, female	6	127,161	58	130	124.1
Examiners, male	7	55,152	25	26	4.0
Examiners, female	5	22,860	10	13	30.0
Bushelers, male	4	17,142	8	15	87.5
Bushelers, female	4	31,660	14	21	50.0
Trimmers, assorters, and assemblers, male	4	8,571	4	15	275.0
Trimmers, assorters, and assemblers, female	8	104,709	48	68	41.6
Button-makers, male	1	3,326	2	3	50.0
Button-makers, female	3	10,694	5	9	80.0
Button sewers and markers, female	4	50,322	23	56	143.5
Cleaners and label sewers, female	6	17,220	8	26	225.0
Foremen	7	115,398	52	50	.....
Forewomen	6	48,239	22	20	.....
Buttonhole-makers, male	3	7,317	3	4	33.3
Buttonhole-makers, female	8	45,459	21	35	66.7
Total	.....	3,147,935	1,431	2,455	71.6

[1] Taken from the *Monthly Labor Review*, U.S. Bureau of Labor Statistics, August, 1918, p. 6.

* The equivalent number of full-time workers was arrived at by dividing the aggregate of hours actually worked by all employees by the number of hours worked by one employed all the year round, termed a full-time worker. The number of annual hours of a full-time worker (2,200) was arrived at by multiplying the prevailing weekly hours of labor (48) by the annual number of weeks (52) and deducting 56 hours for seven legal holidays, 48 hours, or one working week, for an annual vacation, 122 hours (about 5 per cent of total working time) for temporary disability, and 70 hours, or about nine working days, for the fuelless days of the past year. The allowance for temporary disability was based upon the actual record of one of the larger firms, which record showed a percentage of time lost by reason of temporary disability of slightly below 5.

TABLE II[1]

LABOR TURNOVER IN A MOTOR VEHICLE MANUFACTURING ESTABLISHMENT FOR THE YEAR ENDING APRIL 1, 1918

NAME OF DEPARTMENT AND GENERAL CHARACTER OF WORK	NUMBER OF FULL-TIME POSITIONS	NUMBER OF SEPARATIONS					PERCENTAGE OF TURNOVER PER ANNUM
		Discharged	Laid off	Entered Military Service	Quit	Total	
DAY SHIFT							
Screw: Hand and automatic screw machines, heading and slotting	111	4	.....	12	44	60	54.1
Boring mill: Boring, lathes, drilling, milling, wheel assembling	22	1	.....	4	20	25	113.6
Frame: Lathes, drilling, milling, shaping, hand-screw machines, assembling, straightening	150	1	.....	15	82	98	65.3
Axle: Lathes, drilling, milling, screw-machine work, wheel assembling, repairing	246	1	.....	20	120	141	57.3
Gear turning: Lathes, drilling, grinding, hand-screw machines, broaching	104	2	.....	20	50	72	69.2
Tool: Toolmaking, grinding	33	.....	.....	5	9	14	42.4
Brass equipment: Milling, drilling	56	1	.....	7	26	34	60.7
Hospital: Medical attendance	1	.....	.....	.....	1	1	100.0
Polishing: Brass, rough and gear polishing, Gardner disk work, grinding, tumbler-barrel work, and buffing	83	2	.....	.....	35	37	44.6
Clean up: Cleaning and washing	59	11	.....	.....	51	62	105.1
Kitchen: Waiting on, dishwashing, cooking	7	.....	.....	.....	1	1	14.3
Restaurant: Waiting on, dishwashing, cooking	6	.....	.....	.....	6	6	100.0
Engine No. 1: Lathes, drilling, milling, grinding, broaching, boring	276	14	.....	35	147	196	71.0
Engine No. 1, tool: Toolmaking, planing, set-up work, cutting, grinding, millwrights	47	3	.....	5	13	21	44.7
Engine No. 2: Planing, lapping, assembling, scraping, gear testing	311	6	.....	41	137	184	59.2
Gear cutting: Lathes, drilling, milling, gear cutting, pointing and testing, lapping, assembling	145	4	.....	22	63	89	61.4
Ball bearing: Grinding, hand and automatic screw machines, bench assembling	101	1	.....	12	31	44	43.6
Hardening: Furnace attending, hardening, brazing, and blacksmithing	57	2	.....	.....	46	48	84.2
Gear testing: Gear testing	7	.....	.....	1	.....	1	14.3

Drafting: Drafting	6	.....	.....	.....	2	2	33.3
Special drawing: Special drafting	2	.....	.....	.....	1	1	50.0
Experimental: Research, experimenting	7	.....	1	.....	4	5	71.4
Carburetor: Lathes, drilling, milling, gear cutting, pointing and testing, lapping, bench assembling	120	5	.....	19	72	96	80.0
Chassis test: Testing, inspecting, carwashing	57	9	.....	22	22	53	93.0
Garage: Maintenance work	8	.....	.....	.....	.....	.....	0.0
Erecting: Chassis assembling, punch pressing, and metal-work	397	6	.....	19	168	193	48.6
Power: Caring for machinery, ash and coal passing	121	6	.....	7	81	94	77.7
Big four: Common labor	4	2	.....	.....	8	10	250.0
Shipping: Attending to freight trains, common labor	8	.....	.....	.....	5	5	62.5
Finish test: Finish testing work	63	6	.....	18	24	48	76.2
Electrical: Electrical work	25	2	.....	2	8	12	48.0
Paint: Painting	211	.....	.....	10	47	57	27.0
Trimming: Upholstering	80	.....	.....	7	11	18	22.5
Truck assembling: Truck assembling, blacksmithing	101	2	.....	12	28	42	41.6
Crating: Packing or boxing	38	3	19	5	38	65	171.1
Tire: Tire and wheel assembling	22	1	.....	2	7	10	45.5
Touring-car equipment: Equipment assembling	9	.....	.....	1	1	2	22.2
Carwashing: Washing and cleaning	10	.....	.....	.....	9	9	90.0
Storage: Driving, general labor, clerical	25	.....	.....	5	12	17	68.0
Order: Clerical	10	1	.....	3	2	6	60.0
Body: Clerical	8	1	.....	1	7	9	112.5
Purchasing: Purchasing and clerical	21	4	1	3	18	26	123.8
Superintendent's office: Clerical	5	.....	.....	2	1	3	60.0
Stock: Filling orders, packing, stock chasing, clerical	21	3	.....	2	8	13	61.9
Cost: Clerical	21	1	1	2	11	15	71.4
Time: Clerical	11	.....	.....	1	10	11	100.0
Employment: Clerical	3	.....	.....	.....	3	3	100.0
Telephone: Operating	4	1	.....	.....	3	4	100.0
Freight in: Truck driving	11	2	.....	3	1	6	54.5
Inside receiving: Clerical and common labor	25	2	.....	3	14	19	76.0
Outside receiving: Clerical and common labor	16	.....	.....	.....	13	13	81.3
Parts and stock: Filling orders, packing, stock chasing, clerical	84	2	.....	15	41	58	69.0
Repair: Repairing, testing	99	7	.....	30	45	82	82.8
Service: Car repairing	8	.....	.....	1	15	16	200.0
Total	3,483	119	22	394	1,622	2,157	61.9

TABLE II—*Continued*

Name of Department and General Character of Work	Number of Full-Time Positions	Number of Separations					Percentage of Turnover per Annum
		Discharged	Laid off	Entered Military Service	Quit	Total	
NIGHT SHIFT							
Screw: Hand and automatic screw machines, heading, slotting	77	2	.....	9	33	44	57.1
Boring mill: Boring, lathes, drilling, milling, and wheel assembling	4	.....	.....	.....	2	2	50.0
Frame: Lathes, drilling, milling	72	1	.....	20	42	63	87.5
Axle: Lathes, drilling, milling, grinding, hand-screw machines, bench assembling	129	3	.....	18	71	92	71.3
Gear turning: Lathes, grinding, hand-screw machines, broaching, drilling	81	6	.....	8	64	78	96.3
Tool: Lathes, milling, grinding	11	2	.....	1	10	13	118.2
Brass equipment: Drilling, milling	19	.....	.....	4	11	15	78.9
Polishing: Rough polishing and grinding, Gardner disk and tumbling-barrel work	40	1	.....	3	26	30	75.0
Clean up: Cleaning	4	.....	.....	.....	1	1	25.0
Kitchen: Cooking, dishwashing	2	.....	.....	.....	1	1	50.0
Engine No. 1: Lathes, drilling, milling, grinding, boring, benchwork	214	14	.....	37	121	172	80.4
Engine No. 1 tool: Toolmaking	11	1	.....	1	3	5	45.5
Engine No. 2: Testing, lapping	7	.....	.....	1	1	2	28.6
Gear cutting: Lathes, drilling, milling, gear cutting, benchwork, lapping, inspecting	70	2	.....	7	35	44	62.9
Ball bearing: Bearing grinding, hand and automatic screw-machine work	61	1	.....	5	24	30	49.2
Hardening: Furnace attending	5	.....	.....	1	2	3	60.0
Carburetor: Lathes, drilling, milling, screw machines	30	3	.....	8	25	36	120.0
Garage: Maintenance work	1	.....	.....	.....	2	2	200.0
Erecting: Chassis assembling, punch pressing, and metal-work	130	.....	.....	12	73	85	65.4
Stock: Clerical	2	.....	.....	.....	1	1	50.0
Time: Clerical	1	.....	.....	.....	1	1	100.0
Parts and stock: Clerical	2	1	.....	.....	.....	1	50.0
Total	973	37	.....	135	549	721	74.1
Grand total	4,456	156	22	529	2,171	2,878	64.6

positions. In connection with Table I this computation factor was arrived at by an actual census of the number of different persons who filled the positions. For lack of suitable records no such census could be made in connection with the study on which Table II is based. As a substitute the total of annual separations was taken.

The method of computing the base (size of working force) for the labor-turnover calculations shown in Tables I and II is frequently impractical, for the reason that many establishments do not possess the requisite labor-hour records. The unsatisfactoriness of the labor-turnover computation formula shown in Table II is further increased by the fact that it is also based upon gross separations, irrespective of replacements. It is apparent, of course, that many separations, such as those due to reductions in the working force, were not subject to replacement and therefore constituted no labor turnover.

The subject of the methods to be followed in computing labor turnover has frequently been discussed of late at meetings of local and national employment managers' associations and in industrial management publications such as *Factory and Industrial Management.* The National Conference of Employment Managers, held at Rochester, New York, May 9 to 11, 1918, adopted the following report on the standard definition of labor turnover and the method of computing the percentage of labor turnover.[1]

STANDARD DEFINITION OF LABOR TURNOVER AND METHOD OF COMPUTING THE PERCENTAGE OF LABOR TURNOVER

Labor turnover for any period consists of the number of separations from service during that period. Separations include all quits, discharges, and lay-offs for any reason whatsoever.

The percentage of labor turnover for any period considered is the ratio of the total number of separations during the period to the average number of employees on the force report during that period. The force report gives the number of men actually working each day as shown by attendance records. . . . .

To compute the percentage of labor turnover for any period, find the total separations for the period considered and divide by the average of the

[1] A full statement of this report was published in the *Monthly Review*, U.S. Bureau of Labor Statistics, June, 1918, pp. 172–73.

number actually working each day throughout the period. Then multiply by the proper factor to reduce to a yearly basis. . . . .

The method of computing percentage of labor turnover for one year, assuming that records of daily attendance are averaged for each month, is as follows:

Total number of separations during the year..... 5,020

Average number working each month as determined from the force reports or daily attendance records:

May	2,040	November	2,280
June	2,100	December	2,240
July	2,000	January	2,250
August	1,980	February	2,170
September	2,200	March	2,230
October	2,220	April	2,400

Average for year = 2,176

Percentage of labor turnover $\frac{5,020}{2,176} = 231$ per cent

In case the number employed by a plant or a department of a plant decreases because it is the deliberate policy of the plant management to reduce permanently its working force, this fact should be explicitly stated and the reasons for the reduction in force given.

This method for computing labor turnover was used by the United States Bureau of Labor Statistics in some of its recent studies on labor turnover.[1] The relative unsatisfactoriness of this method, however, is already being realized.[2] The dissatisfaction centers on the point specifying separations, irrespective of their replacement, as one of the computation factors. Those objecting to the use of gross separations maintain that turnover does not begin to exist until the actual replacement of separations has occurred, and only to that extent.

Three separate and distinct factors enter into the computation of labor turnover. These are: (1) the working force or number of positions, (2) the separations, and (3) the replacements. A brief discussion of the nature of each of these three factors and of the possible methods of measuring them will, it is hoped, throw some light on the question of definition and computation of labor turnover.

[1] See *Monthly Labor Review* (October, 1918), p. 4; (January, 1918), pp. 11–29.

[2] See symposium on "Computing Labor Turnover," *Industrial Management* (September, 1918), pp. 239–47. The majority of the contributors to this symposium appear to have realized the undesirability of basing turnover computations upon gross separations, as per specifications of the Conference of Employment Managers.

1. *The working force.*—An accurate measurement of the annual working force (the number of full-time positions) of any establishment is found by comparing the total annual hours of labor of the entire force with the total labor hours of one fully employed person. This method of measuring the size of the working force was used in connection with the studies some of the results of which were presented in Tables I and II. The method, though satisfactory from a scientific point of view, is frequently impractical, for the reason that many establishments do not keep labor-hour records. In the absence of such records the size of the working force may be arrived at in two distinct ways: (*a*) by computing the daily average pay-roll number, and (*b*) by computing the daily average number actually at work. The first method possesses a definite advantage and an equally definite disadvantage. Its advantage lies in its relative simplicity and in the fact that it is a familiar term to every employer. Its disadvantage arises from the fact that pay-roll records are seldom kept daily, and that, irrespective of the period covered, they almost invariably contain absentees and unrecorded separations. The difference between the daily average pay-roll number and average number actually at work amounts at times to 10 or 12 per cent. By taking the pay-roll average as the computation base one gets an inflated working force, that is, a working force nominally larger than it actually is. The inflation in the computation base diminishes the extent of labor turnover finally shown.

The daily average number actually at work constitutes no doubt a more accurate measurement of the working force. Such an average, however, presupposes the existence of daily attendance records or force sheets, which frequently are not to be found. The above-mentioned Conference of Employment Managers agreed, however, to take the daily average actually at work as the correct base for computing labor turnover. The Federal Bureau of Labor Statistics, in compliance with this agreement, is using this base of labor-turnover computation at the present time.

2. *Separations.*—Separations include all permanent detachments from service, irrespective of their replacement. Such separations are due largely to discharges, lay-offs, voluntary quits, deaths, etc.,

and in time of war, as during the past year, to entrances into military service.

3. *Replacements.*—A replacement is a separation for which a substitute is needed and hired. Frequently there is a considerable difference between the gross or total separations and what might be called the net separations, or separations actually replaced. In an expanding organization, when in addition to those being replaced new men are hired for newly created positions, the number of net or replaceable separations is equal to the total or gross number of separations. The situation is reversed when a reduction of force takes place. The extent of the replaced separations in such a situation is shown correctly by the number hired.

Having arrived at a more or less definite idea of the nature of the three factors entering into the computation of labor turnover—the force, the separations, and the replacements—an attempt may be made to present a definite labor-turnover formula. In fact, two turnover formulas must be formulated, one to be used in instances of expanding organizations and the other when reductions in the working force take place. If the letter F is taken to denote the size of the force, S the extent of gross separations, H the number hired, and T the percentage of labor turnover, the formulas will be (*a*) $T=\frac{S}{F}$ in an expanding organization, and (*b*) $T=\frac{H}{F}$ in an organization which is reducing its force. It is apparent, of course, that in an organization remaining stationary the numerical strength of S and H are the same. In such instances either of the two formulas might be used.

The essential importance of labor-turnover records arises out of the fact that turnover figures, if properly compiled, furnish an accurate means of gauging the relative soundness of the labor policies of the organization. A volume of turnover larger than the prevailing local average for the industry may indicate decided dissatisfactions with wages, working conditions, etc. A relatively low turnover may be said to indicate the opposite, that is to say, a fair degree of contentment among the employees.

To be of practical value, labor-turnover figures should be compiled in a manner which will reveal the specific groups of employees:

shift, department, occupation, or length-of-service group in which the various volumes of turnover are found. The great difference in the volume of turnover in different occupations is shown clearly in Table I presented above. Some occupations in the cloak, suit, and skirt industry of Cleveland, such as female cleaners and label sewers, and male trimmers, assorters, and assemblers, show turnover extents more than three times as large as the average for the industry, and more than four times as large as that found in some of the other occupations. The variations in the extent of labor turnover in different departments of the same organization is illustrated in Table II. Some departments, such as "Big Four: common labor," day shift, and "Garage: maintenance work," night shift, show turnover extents about four times as large as the average for the establishment. Again, another department, namely "Screw, hand, and automatic screw machines, heading and slotting," day shift, shows a turnover extent smaller than the average for the organization.

It is obvious that groups with short records of service must necessarily show relatively higher extents of turnover. Table III, which was taken from one of the recent studies of the Federal Bureau of Labor Statistics,[1] shows the relative extent to which various length-of-service groups of employees are responsible for turnover.

This table shows that the groups with records of continuous service of less than one month, while constituting only about 11 per cent of the force, were responsible for more than 40 per cent of the separations. The chances for separation appear to decrease greatly with increased service. The service group of five years and over—17.5 per cent of the organization—was responsible for only 1.9 of the total number of separations.

In this connection it might be of interest to illustrate the bearing of the existence of specific separation groups upon the instability of the working force. In the following illustrative calculations the size of each service group is indicated by the mean of its lower and upper limits.

The existence of a "one week or less" separation service group, with a mean length of employment of 3.5 days, would necessitate

[1] *Monthly Labor Review* (January, 1919), pp. 11–29.

the hiring of 103 persons per position per year, over and above the worker originally hired to fill the job. Such a replacement extent would be equivalent to an annual labor turnover of 10,284 per cent. A separation service group of "over one week to two weeks," with a mean service duration of 10.5 days, would compel the hiring of 34 extra persons per position per year, or a labor turnover of 3,396

TABLE III[1]

PROPORTION IN EMPLOY AND AMONG THE SEPARATIONS OF CERTAIN IDENTICAL LENGTH-OF-SERVICE GROUPS OF EMPLOYEES IN 18 ESTABLISHMENTS IN CLEVELAND

LENGTH-OF-SERVICE GROUP	PERCENTAGE OF TOTAL	
	Employed	Separations
Under 7 days	3.2	19.3
7 days and under 2 weeks	3.1	10.9
2 weeks and under 1 month	4.8	13.1
1 month and under 3 months	12.8	21.4
3 months and under 6 months	10.4	13.4
6 months and under 1 year	16.1	10.8
1 year and under 2 years	14.4	4.8
2 years and under 3 years	8.5	2.6
3 years and under 5 years	9.2	1.8
5 years and over	17.5	1.9
	100.0	100.0

per cent per annum. The presence of an "over two weeks to one month" separation class, with a mean duration of service of 22 days, would cause 16 extra replacements per job per year, or a turnover of 1,563 per cent. Similarly the existence of "over one month to three months" group causes the hiring of 5 extra persons per position per year. The latter volume of replacement is equivalent to an annual labor turnover of 508 per cent.

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[1] Taken from the *Monthly Labor Review*, U.S. Bureau of Labor Statistics (January 1919), pp. 11–29.